CS6630 Realistic Image Synthesis

Markov Chain rendering

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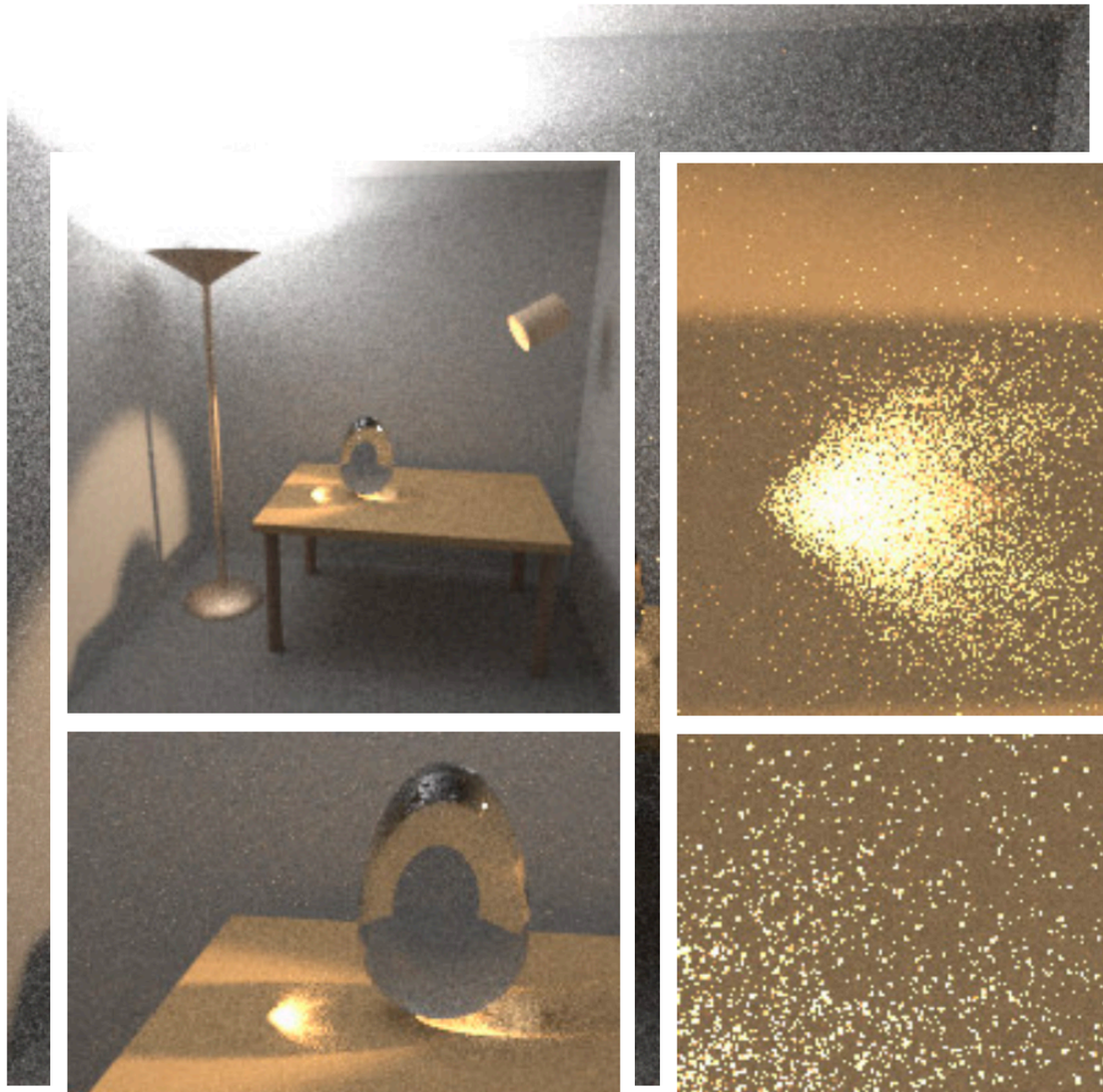
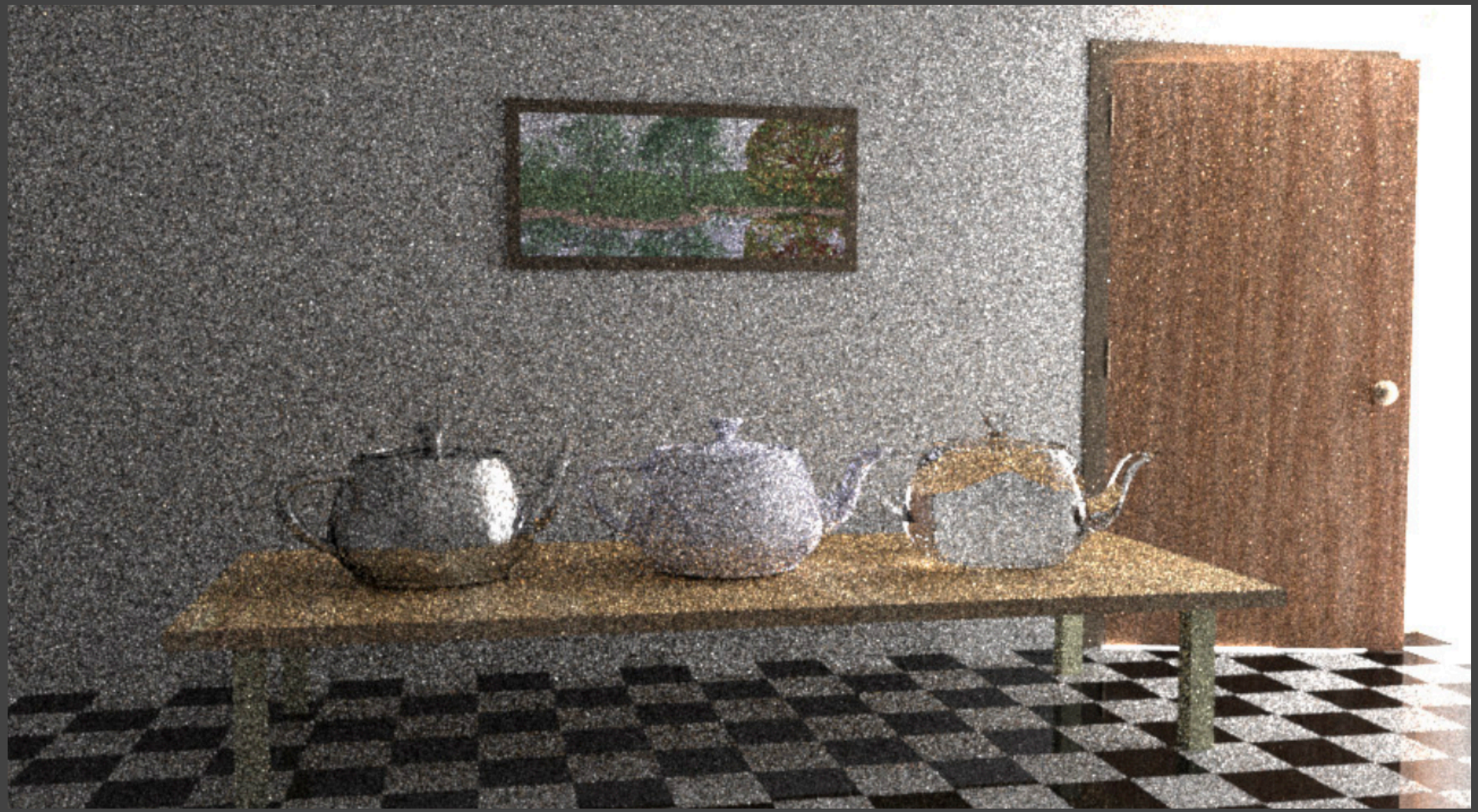
Fall 2022



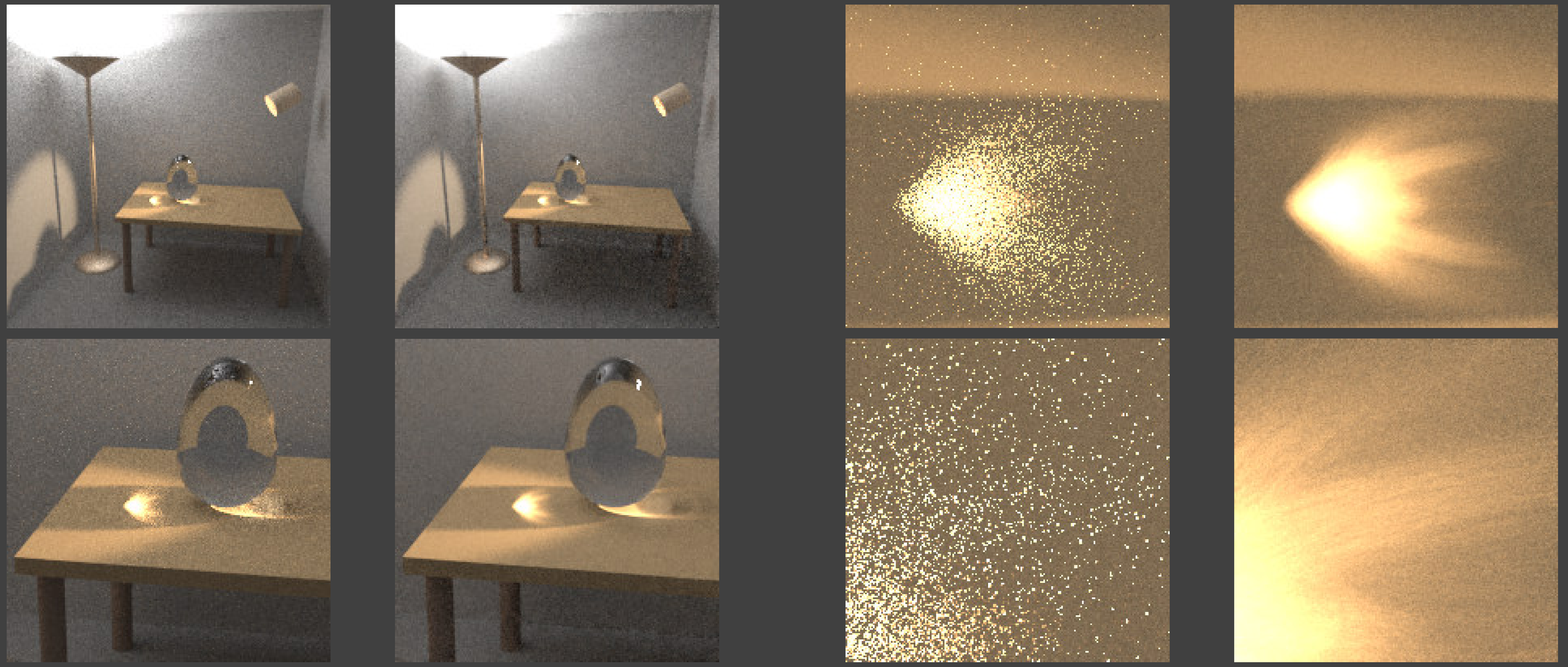
(a) Bidirectional path tracing with 25 samples per pixel

[Veach 1997]



[Veach 1997] Bidirectional Path Tracing, 40 samples per pixel

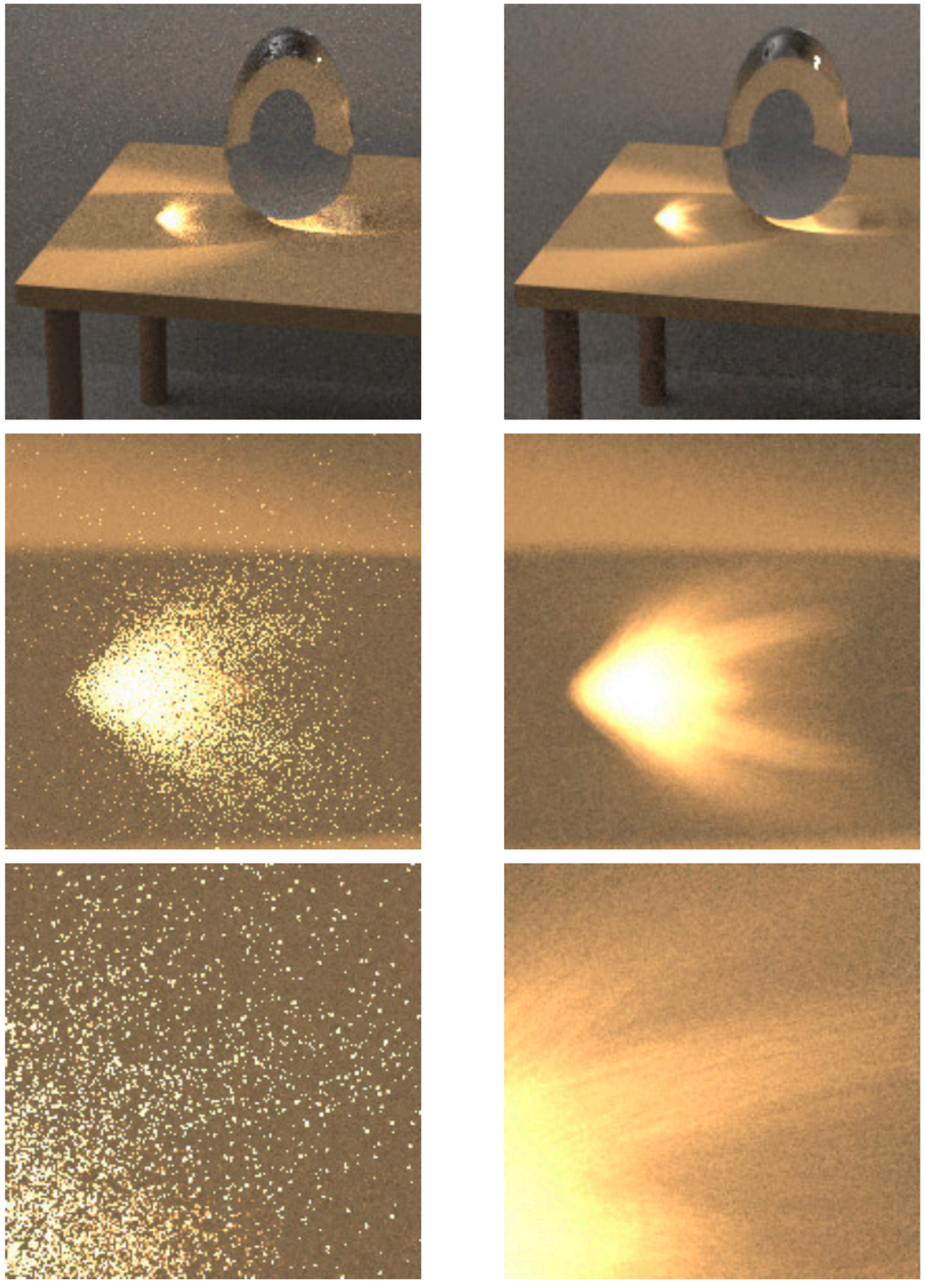
[Veach 1997] Metropolis light transport, 250 samples per pixel



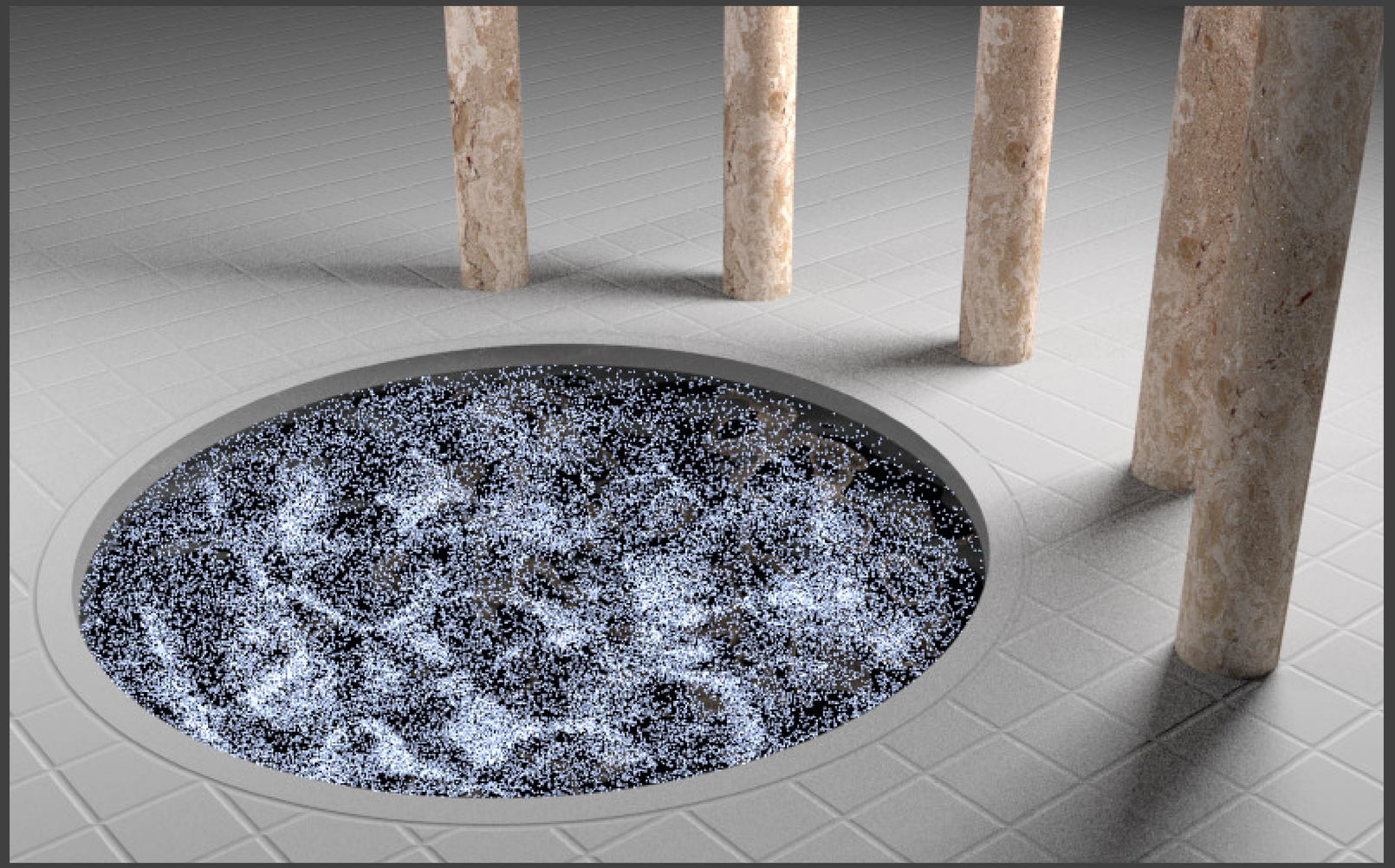
BDPT **MLT** **BDPT** **MLT**

(matched # ray intersection queries)

[Veach 1997]

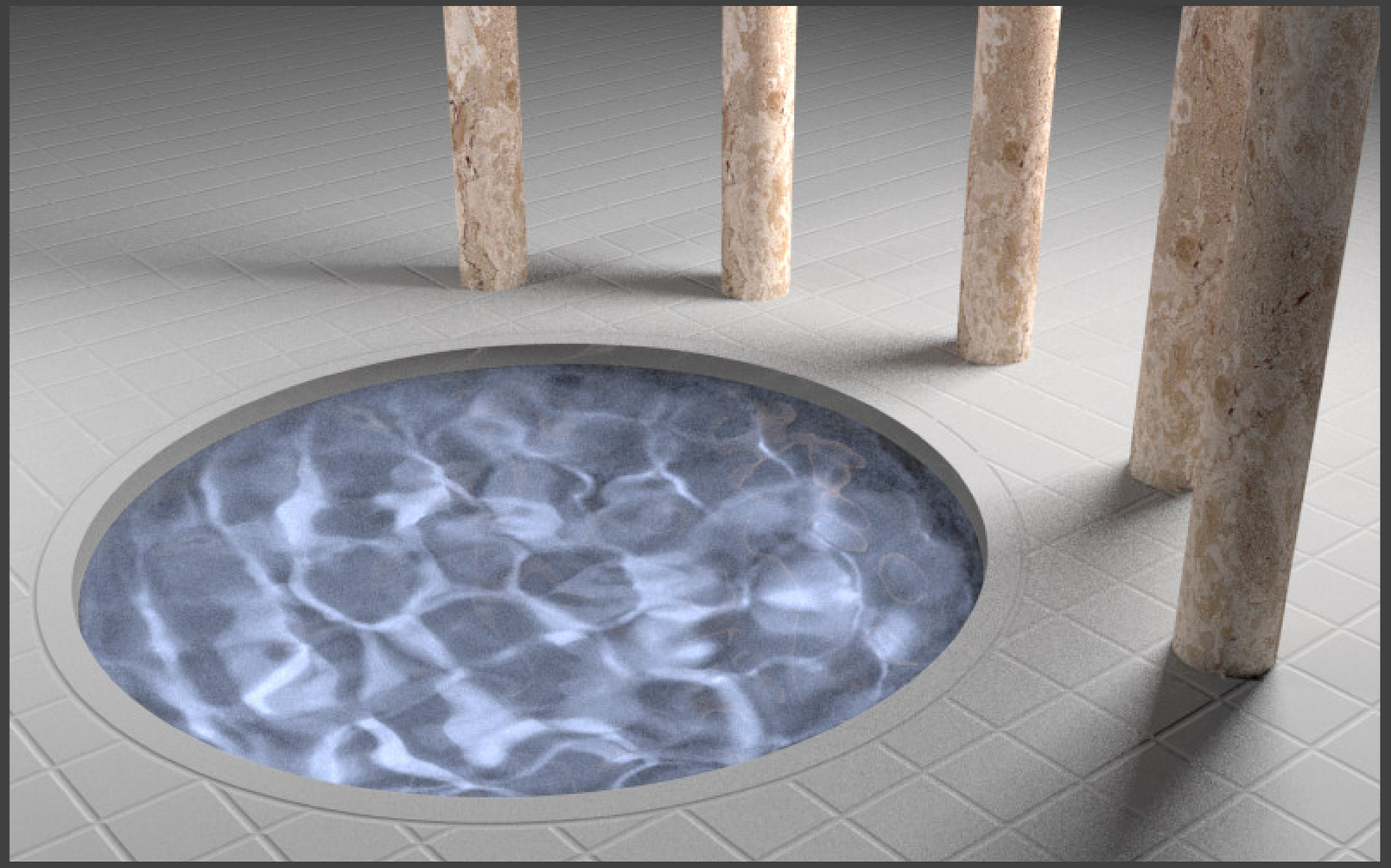


[Veach 1997]
Left: bidirectional path tracing
Right: Metropolis light transport
(matched # ray intersection queries)

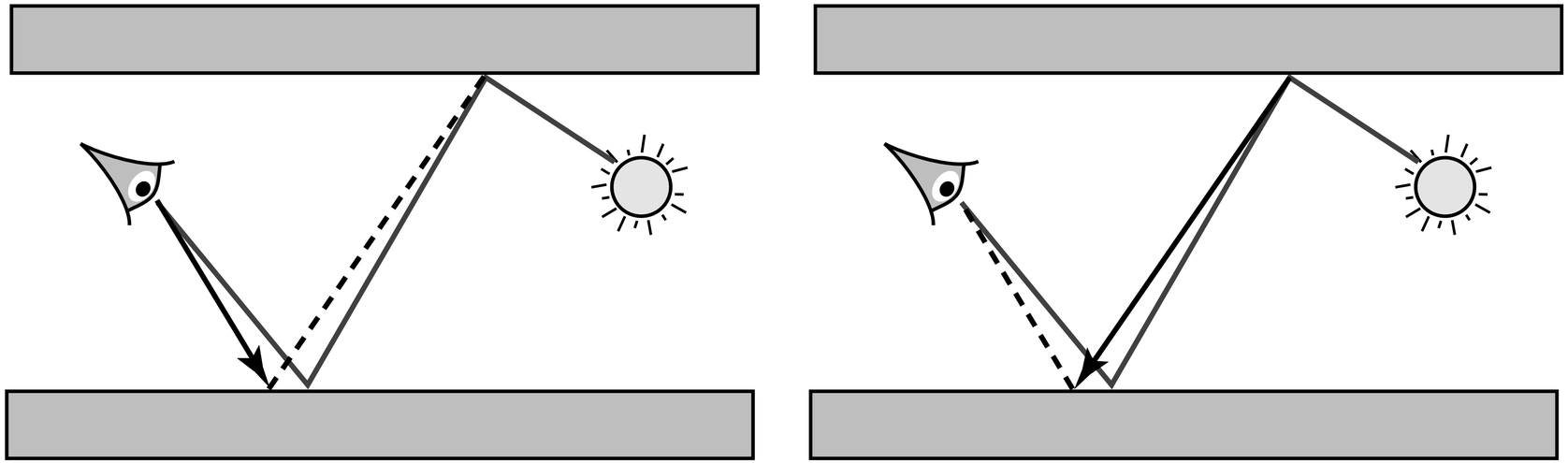


bidirectional path tracing

[Veach 1997]



Metropolis light transport



Lens perturbation

Caustic perturbation

Figure 11.4: The lens edge can be perturbed by regenerating it from either side: we call these *lens perturbations* and *caustic perturbations.*

[Veach 1997]

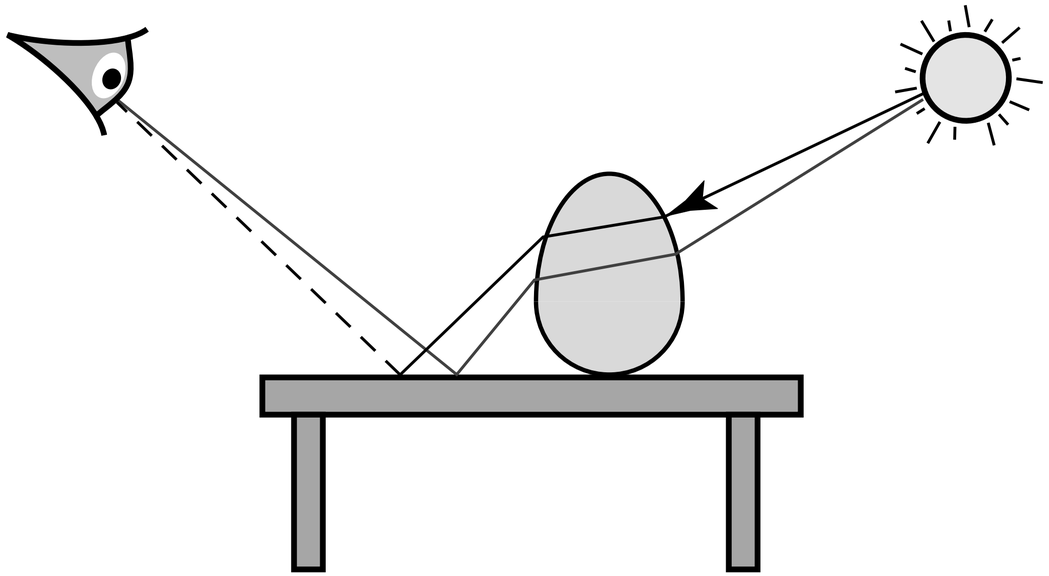


Figure 11.5: A caustic perturbation. A new path is generated by perturbing the direction of the ray from the light source by a small amount, and then tracing the perturbed ray through the same sequence of specular reflections and refractions as the original path.

[Veach 1997]

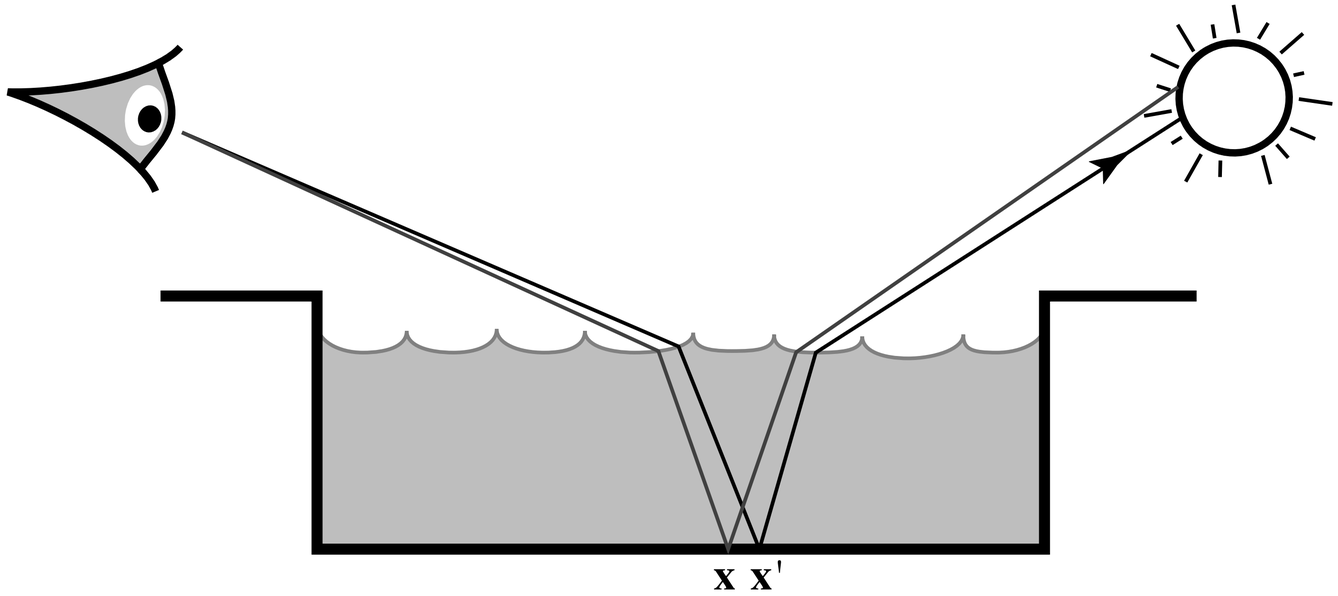


Figure 11.6: Using a two-chain perturbation to sample caustics in a pool of water. First, the lens edge is perturbed to generate a point $\mathbf{x}'$ on the pool bottom. Then, the direction from original point $\mathbf{x}$ toward the light source is perturbed, and a ray is cast from $\mathbf{x}'$ in this direction.

[Veach 1997]